

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Previously Presented) An apparatus for relieving trapped annular fluid pressure between a plurality of nested casing strings, comprising:

a housing having an outer surface and a hollow inner cavity and adapted for installation between adjacent nested casing strings;

a set of end connections disposed on opposite ends of the housing, which are adapted to join adjacent sections of one of the plurality of nested casing strings;

at least one valve disposed in the housing, which opens in response to a predetermined annular fluid pressure enabling fluid to pass from an outer annulus between adjacent nested casing strings disposed outside the housing to an annulus between different adjacent nested casing strings disposed inside the hollow inner cavity.

2. (Original) The apparatus according to claim 1, wherein the housing comprises a plurality of equally spaced centralizer blades disposed around the outer surface of the housing.

3. (Original) The apparatus according to claim 2, wherein a central bore is formed through a substantial portion of each centralizer blade.

4. (Original) The apparatus according to claim 3, wherein at least one bore is formed through each centralizer blade, which opens to the central bore.

5. (Previously Presented) The apparatus according to claim 4, further comprising a rupture disc is secured into the at least one bore, and wherein the rupture disc is adapted to burst at a predetermined fluid pressure and thereby cause fluid to enter the central bore.

6. (Original) The apparatus according to claim 5, further comprising a filter assembly disposed within the central bore of each centralizer blade, said filter assembly comprising an inlet filter and a pair of seals disposed at opposite ends of the inlet filter, such that fluid entering the central bore is directed through the inlet filter.

7. (Original) The apparatus according to claim 6, wherein the at least one valve is formed within the central bore of each centralizer blade and is disposed axially adjacent to the filter assembly and in fluid communication therewith.

8. (Original) The apparatus according to claim 7, wherein the at least one valve comprises a gas lift valve coupled to at least one check valve.

9. (Original) The apparatus according to claim 8, wherein the gas lift valve comprises a nitrogen-charged bellows and a plunger, which is biased against a seat in the closed position by the bellows.

10. (Original) The apparatus according to claim 9, wherein the at least one check valve comprises a soft elastomeric seat, a hard stainless steel seat disposed beneath the soft elastomeric seat and a stainless steel check dart, which is initially sealed against the soft seat by a spring.

11. (Original) The apparatus according to claim 3, wherein a recess is milled into each centralizer blade proximate the central bore and in fluid communication therewith, and wherein the recess is disposed downstream of the at least one valve.

12. (Original) The apparatus according to claim 11, further comprising an outlet filter secured within the recess.

13. (Original) The apparatus according to claim 12, wherein a shoulder is formed within the recess and a plate is secured to the shoulder of the recess such that a fluid chamber is formed between the plate and the outlet filter secured within the recess, and the fluid chamber is in communication with the central bore.

14. (Original) The apparatus according to claim 13, further comprising a plurality of holes formed in the housing beneath the outlet filter, which allow the fluid to exit into the annulus disposed inside the hollow inner cavity of the housing.

15. (Original) The apparatus according to 14, further comprising an opening sleeve temporarily secured to the housing adjacent to the plurality of holes formed in the housing

beneath the outlet filter, wherein the opening sleeve is disposed in the annulus inside the hollow inner cavity of the housing.

16. (Original) The apparatus according to claim 4, further comprising at least one inlet filter secured to each centralizer blade, such that fluid from the annulus disposed outside the housing passes through the inlet filter into the at least one bore.

17. (Original) The apparatus according to claim 2, wherein the plurality of equally spaced centralizer blades are integrally formed with the outer surface of the housing.

18. (Original) The apparatus according to claim 1, further comprising at least one blade formed in the outer surface of the housing.

19. (Original) The apparatus according to claim 18, wherein the outer surface of the housing and inner hollow cavity of the housing are cylindrical and eccentric to one another.

20. (Original) The apparatus according to claim 19, wherein a central bore is formed through a substantial portion of the at least one blade.

21. (Original) The apparatus according to claim 20, wherein at least one bore is formed through the at least one blade, which opens to the central bore.

22. (Original) The apparatus according to claim 21, wherein a rupture disc is secured into the at least one bore, and wherein the rupture disc is adapted to burst at a predetermined fluid pressure and thereby cause fluid to enter the central bore.

23. (Original) The apparatus according to claim 22, further comprising a filter assembly disposed within the central bore of the at least one blade, said filter assembly comprising an inlet filter and a pair of seals disposed at opposite ends of the inlet filter, such that fluid entering the central bore is directed through the inlet filter.

24. (Original) The apparatus according to claim 23, wherein the at least one valve is formed within the central bore of the at least one blade and is disposed axially adjacent to the filter assembly and in fluid communication therewith.

25. (Original) The apparatus according to claim 24, wherein the at least one valve comprises a gas lift valve coupled to at least one check valve.

26. (Original) The apparatus according to claim 25, wherein the gas lift valve comprises a nitrogen-charged bellows and a plunger, which is biased against a seat in the closed position by the bellows.

27. (Original) The apparatus according to claim 26, wherein the at least one check valve comprises a soft elastomeric seat, a hard stainless steel seat disposed beneath the soft elastomeric seat and a stainless steel check dart, which is initially sealed against the soft seat by a spring.

28. (Original) The apparatus according to claim 20, wherein a recess is milled into the at least one blade proximate the central bore and in fluid communication therewith, and wherein the recess is disposed downstream of the at least one valve.

29. (Original) The apparatus according to claim 28, further comprising an outlet filter secured within the recess.

30. (Original) The apparatus according to claim 29, wherein a shoulder is formed within the recess and a plate is secured to the shoulder of the recess such that a fluid chamber is formed between the plate and the outlet filter secured within the recess, and the fluid chamber is in communication with the central bore.

31. (Original) The apparatus according to claim 30, further comprising a plurality of holes formed in the housing beneath the outlet filter, which allow the fluid to exit into the annulus disposed inside the hollow inner cavity of the housing.

32. (Original) The apparatus according to 31, further comprising an opening sleeve temporarily secured to the housing adjacent to the plurality of holes formed in the housing beneath the outlet filter, wherein the opening sleeve is disposed in the annulus inside the hollow inner cavity of the housing.

33. (Original) The apparatus according to claim 21, further comprising at least one inlet filter secured to the at least one blade, such that fluid from the annulus disposed outside the housing passes through the inlet filter into the at least one bore.

34. (Original) The apparatus according to claim 19, wherein the at least one blade is integrally formed with the outer surface of the housing.